THE EFFECT OF ADDING SALT TO A CANOLA MEAL SUPPLEMENT ON WOOL GROWTH IN WEANER SHEEP

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SUMMARY

Canola meal is one of the better sources of protein for stimulating wool growth. The aim of this work was to determine if adding salt to canola meal would increase the amount and efficiency of wool grown. The sheep were fed 560 g/d of a basal diet of wheaten hay and a mineral mix (Siromin®). All sheep were offered for six weeks a supplement of 1050 g/week canola meal with 0, 280, 560 or 840 g of added salt. Sheep fed the supplement containing 840 g salt decreased their intake of the canola meal-salt supplement compared to those fed other levels of salt. As the amount of salt in the diet increased so did water intake. There was a polynomial increase in wool growth in response to level of added salt but the effect was only significant at $P < 0.12$. When wool growth was expressed as a function of supplement intake there was a significant linear increase in wool growth as the amount of salt in the supplement increased ($P = 0.015$). It is concluded that it may be possible to use salt as a feed intake limiter when feeding high protein feeds such as canola meal without detrimental effects on wool production, fibre diameter or liveweight gain.

Keywords: canola meal, salt, wool growth, sheep

INTRODUCTION

The reduction in wool production and wool quality associated with the poor feed supply during autumn in the south-west of Australia is of major concern to wool producers because it is during this period that fibre thinning occurs and staple strength is decreased. This is then reflected in reduced wool processing performance and price received by the producer. To combat this, farmers provide their ewes and weaner sheep with supplementary feed during the autumn. However, most supplementary feeds are provided only to minimise weight loss and little consideration has been given to ensuring that wool growth is optimised.

The most successful supplementary feeding strategy is one which maximises the quantity and quality of available protein reaching the small intestine per unit of feed cost, because it is the supply of amino acids, particularly sulfur amino acids, which determine wool growth (Reis 1979). Expeller canola meal is a possible candidate for strategic use in certain situations because of its high level of sulfur amino acids and its high degree of protection against degradation in the rumen (Masters *et al*. 1996). A possible method for further improving the efficiency of a protein supplement for wool growth is to increase the outflow rate of protein from the rumen, thereby reducing protein degradability. Hemsley (1975) was the first to recognise this, and he showed that the addition of 130 g/day of salt to sheep increased rumen outflow rate by 100% and wool growth by 23%. The basal diet consisted of 89% linseed meal fed to maintenance. Our aim in this experiment was to see if salt had a similar effect with canola meal fed under more practical conditions.

MATERIALS AND METHODS

Twenty nine ten month old Merino wether weaners weighing 30.5 ± 0.4 kg were randomly allocated to four treatment groups with seven sheep in each of the first three groups and eight in the fourth. They were held in individual pens and intake of water and feed was recorded daily. The sheep were all fed 560 g/day of a mixture of wheaten hay and a mineral mix (Siromin®, White *et al*. 1992), 550:10, air dry, together with a supplement consisting of 1050 g/week of canola meal fed twice weekly in a separate container from the hay. The treatments consisted of adding salt to the canola meal so that the concentration of salt in the total salt-canola supplement was 0 (control), 21, 35 or 44%. The total amounts of supplement (salt plus canola meal) offered per week for the four treatments were 1050, 1330, 1610 and 1890 g.

The experimental period was six weeks with a two week adjustment period prior to the start of the experiment. Wool growth and fibre diameter measurements were made on samples taken from midside patches during the final three weeks of the treatment period. Fibre diameter measurements were made on 2 mm snippets using an OFDA-065 (Version 2.05, BSC Electronics Pty Ltd). Data analysis was by ANOVA using the micro-computer program Systat (Version 5, Systat Inc, Evanston Ill).

RESULTS

All of the basal diet (560 g/d) was eaten throughout the experiment. The addition of salt to the canola meal increased water intake and reduced canola meal intake (Table 1). The effects on water intake were significant at each level of salt, but canola meal intake was significantly reduced only at the highest level of salt. The linear regression of average water intake against average salt intake was described by the equation Y (L/d) = 2.352 + 0.025 X (g/d); $r^2 = 0.68$; $P < 0.01$. Although not shown in the results, water intake increased sharply to about 7 L on the day of supplement feeding for all salt treatments and then declined between feeds. The depth of the fall between feeding days varied inversely with salt intake, and it was this variation that contributed most to the differences in water intake.

There appeared to be no adaptation by the sheep to the salt in terms of water intake or supplement residue (Figures 1 and 2). Water intake increased with time across all treatments (repeated measures ANOVA, $P < 0.05$) but there was no effect of time on supplement residues.

Increasing salt up to 35% of the supplement increased wool growth by 23% but the differences were not significant, with P values for linear and second order polynomial contrasts of 0.18 and 0.12, respectively (Table 1). When wool growth was expressed as a function of canola intake (mg wool/cm^2 per kg canola), there was a significant linear effect of salt on wool growth ($P = 0.015$). There was no effect of salt intake on mean fibre diameter or liveweight gain (Table 1.).

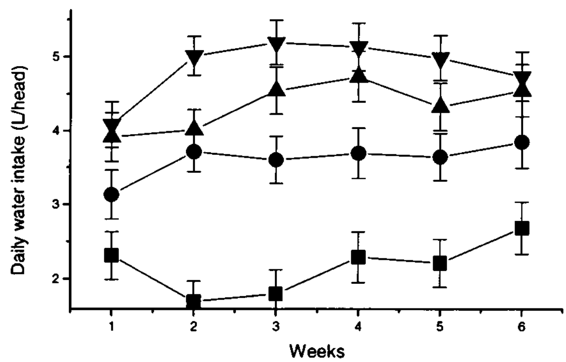

Figure 1. Effect of salt level in the salt-canola meal supplement on water intake (means ± s.e.m.). Treatment symbols are ■ 0% salt,● 21% salt,▲35% salt and▼44% salt.

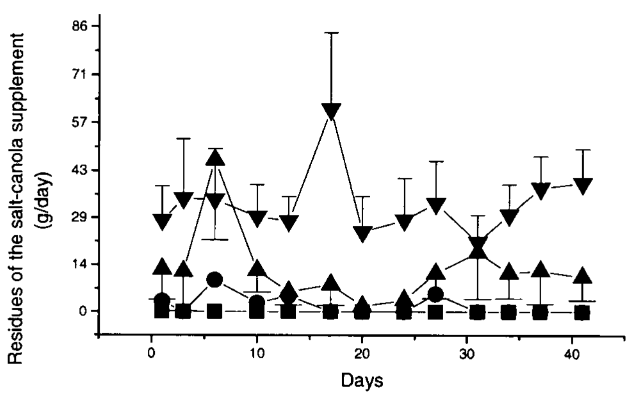

Figure 2. Effect of salt level in the salt-canola meal supplement on residues of the supplement (means ± s.e.m.). Treatment symbols are ■ 0% salt, ● 21% salt,▲35% salt and▼44% salt.

Table 1. Effect of salt treatment on intake of canola meal and water, and on liveweight gain, wool growth, fibre diameter and clean wool growth per amount of canola meal eaten. Values are means ± s.e.m.

	Percentage of salt added to the canola supplement				Significance (P)
	0	21	35	44	
Water intake (L/d)	2.17 ± 0.39[a]	3.60 ± 0.22[b]	4.34 ± 0.19[bc]	4.85 ± 0.23[c]	0.000
Canola intake (g/d)	150 ± 0[a]	148 ± 1[a]	141 ± 4[a]	130 ± 5[b]	0.001
Salt intake (g/d)	0[a]	39 ± 0.3[b]	75 ± 2.2[c]	104 ± 3.8[d]	0.000
Liveweight gain (g/d)	15 ± 10	4 ± 10	-14 ± 10	7 ± 10	0.249
Clean wool ($mg/cm^2/day$)	0.85 ± 0.08	0.98 ± 0.08	1.05 ± 0.08	0.91 ± 0.07	0.120*
Fibre diameter (mm)	19.8 ± 0.22	20.0 ± 0.22	19.9 ± 0.22	19.6 ± 0.22	0.635
Clean wool growth per kg canola ($mg/cm^2/d$)	5.69 ± 0.54	6.58 ± 0.47	7.44 ± 0.51	6.99 ± 0.44	0.015**

[a]Values within rows followed by different superscripts differ at $P < 0.05$. * Polynomial contrast. ** Linear contrast.

DISCUSSION

The addition of salt to a maintenance diet of wheaten chaff and canola improved the efficiency of conversion of feed to wool as there was an additional 1.6 mg of wool grown per unit area per kg of canola meal eaten when 35% of the supplement was salt compared to no added salt. Sheep on the high salt intakes ate considerably less supplement and grew an equivalent amount of wool as sheep fed no salt. Furthermore the quality of the wool was not affected as there was no difference in fibre diameter between the treatments.

The increase in wool growth in response to added salt supported the results of Hemsley (1975) using linseed meal but, unlike Hemsley (1975), the effect of treatment was not significant at the 5% level. The non-significant response may have been due in part to the relatively short period of adjustment and treatment in this experiment and to the fact that Hemsley fed his sheep daily with a much higher level of protein and salt supplement and of a different type to that used here (3738 g linseed meal per week fed daily compared with 1050 g canola meal per week fed twice weekly).

The results are consistent with predictions of an increase in metabolisable protein based on AFRC (1993). If outflow rate is doubled on the days of feeding as shown by Hemsley (1975), then this should result in an increase in the flow of metabolisable protein of approximately 8g/day when canola meal plus hay was fed. This increase in metabolisable protein should result in an increase in clean wool growth of about 9% (Freer *et al.* 1997). The range of responses in the current experiment was 7 to 23%.

Based on the results from this experiment showing increased efficiency of wool growth, and on Hemsley's (1975) results, it is evident that adding salt to high protein supplements can promote higher efficiency of protein use for wool growth as well as higher rates of wool growth. Since salt is less expensive than protein meals, and since it also acts as a limiter to intake, it could be a useful method to obtain maximum wool growth responses per unit of supplement while at the same time minimising excessive consumption and between-animal variation in intake.

One potentially negative aspect of this strategy is increased salinisation of groundwater. For the supplement containing 35% salt, 1000 sheep will excrete 7.5 kg salt/day. In the main wool-producing areas of Western Australia, rainfall contributes about 40 kg of sea salt/ha/year (Hingston and Gailitis 1976). On an annual basis, salt from the supplement may represent a significant increase in the annual input of salt to farmland.

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